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July 13, 1961

CONFIDENTIAL

Dear Sir:

We were quite interested in your letter of June 22, 1961, that presented comments from one of your customers, spelling out the advantages and disadvantages of the Model 1 Incinerator at Installation B. We certainly appreciate his careful discussion of the problems encountered. The job of research and development is made much easier and more interesting when the user of equipment makes the effort to discuss the operation of a device so thoroughly.

Our comments pertaining to each of the points raised by your customer are indicated below, and are identified by corresponding numbers and letters; these are the same comments which we discussed on the telephone on July 6:

1. There is no need for comment.

2. The effect of a prevailing wind of between 10 and 15 knots is to produce a pressure of about 0.1 inch of water in the system. We can think of three possible ways to combat this. One would be to run the stack all the way to the top of the building; thus, the stack opening would be out of the ram pressure zone on the side of the building and some benefit would be gained from a helpful aspiration effect by the wind. A second way would be to install a stainless steel elbow of about 2-inch inside diameter inside the flow pipe and pointing outward against the wind; this elbow would have to be supplied from a special blower, or ducted from the existing blower through a simple interlocking damper, in order to direct a jet of air from the elbow along the axis

of the stack, so as to aspirate the flue-gas flow. Such a special blower could be left on all the time, so as to help in providing slight additional draft during operation and to combat the wind action.

We have encountered similar difficulty in connection with the hundreds of laboratory exhaust fans located on the roofs of our various buildings. Even without any wind, when any one fan is turned off, the internal suction provided by all of the other operating fans has tended to pull air back into the particular building through the inoperative fan. In cold weather, this cold air entering some of the laboratories has been intolerable. Accordingly, our building manager devised a very simple steel flap door for use on the outlet of each exhaust fan. This flap-door device is balanced in a way such that it hangs open when the fan is operating, but falls shut and thus prevents backflow when the fan is off. It would also prevent natural flow outward under calm wind condition, but this probably would be seldom. This would represent a third way of combatting the prevailing-wind situation at Installation B. Further, as discussed over the telephone, your idea of using a V-plate to partially protect the discharge would help some.

3a. The motor driving the fan on this unit was built to operate on either 50- or 60-cycle current, and the fan was chosen so that sufficient air would be provided for elevations up to 1,000 feet by the speed resulting from the use of 50-cycle current. Thus, any failure to deliver enough air so as to produce the desired cyclonic effect is probably more a result of altitude than of current frequency. We have observed that, during short periods of operation on some kinds of paper, no ash remains in the incinerator. However, during burning periods of 3 hours and longer, we usually end up with several pounds

of residual ash. The point here is that much of the ash is carried out of the stack as fine dust, but that gradually the heavier particles can and do accumulate during extended operation. It is probably reasonable to expect that reduced air flow increases the accumulation.

3b. It is, of course, true that at an elevation of over 7,500 feet, the air flow and therefore the burning rate of the device would be reduced. From the measurements you obtained and from our calculations, we estimate that at this altitude, the burning rate would be about 70 per cent of that obtained at sea level.

3c. Theoretically, the ram effect of the prevailing winds on the stack would be to reduce the amount of air flow. However, we estimate that this effect in this instance corresponds to only about 0.1 inch of water, which is quite small as compared to a blower pressure of 7 inches of water.

3d. As we understood it, the 15-1/2-inch blower wheel was used only a short time; and although it is probably true that the 16-7/8-inch wheel may not have improved incinerator effectiveness greatly, we would estimate that it would not impose a much greater load on the motor. We feel that the motor supplied has sufficient reserve to tolerate such a small increase in load.

3e. This motor was designed and built to run continuously at about 72 degrees Fahrenheit above room temperature. Thus, it could run as hot as 150 to 170 F, which would be quite hot to the touch, and yet not really be overheating. The starter box is provided with overload heaters which should shut the motor off if it pulls enough current to overheat. Hence, if the proper size of heaters has been used in the starter box and so long as they do not shut the motor off, it is quite probable that the motor is not overheating.

3f. The burning rates claimed initially for the unit were probably based on sea-level performance, and, as we have pointed out above, at an altitude of 7,500 feet or more the burning rate would be only about 70 per cent of that at sea level. It would be helpful if the customer would keep a record of burning rates obtained over some period of time with various types of paper. We know that the higher the altitude, the less paper will be burned per unit of time; and it would be helpful to us to have more data on just how much less will be burned. We are not surprised to learn that, when attempts were made to burn bound books or paper, a poker had to be used to spread out the material collected at the bottom. We have always made it clear that a small amount of poking is needed in order to achieve complete destruction.

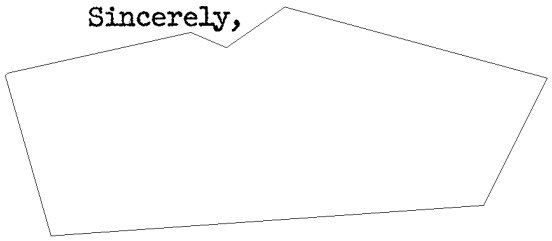
3g. A line voltage of only 205 volts, although within the permissible range for standard motors, is a further complication which causes impaired performance. For the same horsepower load on a motor, as the voltage drops the current increases; this alone will cause higher motor temperatures. In addition, the natural air cooling of the motor is poorer at higher altitudes.

4. The use of an air-intake duct pointed into the wind, as suggested in the sketch, would do no harm; but, as we have already pointed out, the wind impact effect is comparatively small as compared to the pressure output of the fan. Incidentally, if an added intake duct was tried, the inlet to the duct itself should be funnel shaped because the natural effect of air flow into the straight, open pipe is to crowd the flow right at the entrance in a way so as to cause considerable loss of whatever gain might be realized from the ram effect.

July 13, 1961

Thanks again for these helpful comments. We would like to keep in touch with the application of this unit in the field.

Sincerely,



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